Density of HIT Adoption
In RWHC Member Hospitals

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1. Introduction

The primary goal of this study is to determine the levels of health information technology (HIT) system adoption in RWHC member hospitals. Supplementary goals include:

1. To determine the types of clinical data that exist in electronic form in participant hospitals.
2. To determine to what extent rural/community hospitals have implemented EHRs and patient safety systems.
3. To draw conclusions from the results for public policy related to statewide data exchange efforts.

Whereas EHRs in physician clinics tend to be comprised of a single or small number of systems, EHRs in the hospital environment tend to be comprised of dozens of systems, each of which contributes to the patient's electronic health record. In order to understand a hospital's level of EHR adoption, it is important to determine which of these systems the hospital has implemented.

This study is a quantitative analysis of whether or not participants have implemented any of 16 key HIT systems. The data for this study was collected through phone interviews with hospital information technology personnel.

2. HIT Density Study Participants

All 30 Rural Wisconsin Health Cooperative member hospitals, listed below, participated in this study. RWHC members include 25 critical access hospitals (which represent 45% of Wisconsin CAHs), and 5 hospitals with between 30 and 100 beds. RWHC member hospitals make up 22% of all Wisconsin hospitals.

RWHC Member Hospitals
Berlin Memorial Hospital (Berlin)
Black River Memorial Hospital (Black River Falls)
Boscobel Area Health Care (Boscobel)
Columbus Community Hospital (Columbus)
Divine Savior Healthcare (Portage)
Door County Memorial Hospital (Sturgeon Bay)
Edgerton Hospital and Health Services (Edgerton)
Grant Regional Health Center (Lancaster)
Langlade Memorial Hospital (Antigo)
Memorial Health Center (Medford)
Memorial Hospital of Lafayette County (Darlington)

Memorial Medical Center (Neillsville)
Mile Bluff Medical Center (Mauston)
The Monroe Clinic (Monroe)
Moundview Memorial Hospital and Clinics (Friendship)
Our Lady of Victory Hospital (Stanley)
Prairie du Chien Memorial Hospital (Prairie du Chien)
Reedsburg Area Medical Center (Reedsburg)
The Richland Hospital (Richland Center)
Ripon Medical Center (Ripon)
Sauk Prairie Memorial Hospital and Clinics (Prairie du Sac)
Shawano Medical Center (Shawano)
Southwest Health Center (Platteville)
St Clare Hospital and Health Services (Baraboo)
St Joseph's Community Health Services (Hillsboro)
Stoughton Hospital (Stoughton)
Tomah Memorial Hospital (Tomah)
Tri-County Memorial Hospital (Whitehall)
Upland Hills Health (Dodgeville)
Vernon Memorial Healthcare (Viroqua)

3. HIT Density Indicators

The following sixteen indicators were chosen as indicative of HIT density. This is not a comprehensive list of hospital EHR type systems, but covers many of the key systems associated with the concept "EHR." In those cases where there is significant ambiguity as to what constitutes a given system, the system was defined as indicated below. The definitions aren't meant to be authoritative, but were developed to ensure the consistency of the responses.

1. **Core MPI/Database/ADT** (Admit, Discharge, Transfer)
2. **Lab Information System**
3. **Pharmacy System**
4. **E-MAR** (real-time enterprise MAR)
   - A common electronic medication administration record that is used and updated in real-time by both pharmacists and providers.
5. **Medication Dispensing**
   - Computerized medication dispensing systems such as Pyxis, Omnicell, and Accudose.
6. **Radiology Information System** (RIS)
7. **Computerized Radiography** (Digital X-ray)
8. **PACS**
   - Picture Archive Communication System. A storage and management system for digital images that largely replaces or has the capacity to replace the Radiology department's film-based operations.
   - Hospitals are designated as PACS facilities if they (1) own their own PACS system, or (2) lease PACS space from another provider.
9. **Order Entry/Resulting**

- The automation of the ordering, resulting, and billing process within departments such as Lab, Radiology, Pharmacy, and others.

10. Inpatient Charting
- Inpatient nursing documentation is inputted electronically and available online

11. Bedside Medication Verification
- Barcoding medications in unit dose, and then using a barcode reader at the bedside to verify that the right patient is getting the right medication at the right time.

12. CPOE (Computerized Provider Order Entry)
- There is some controversy as to how and whether CPOE is distinguished from traditional order entry systems. For our purposes, CPOE is defined as an order entry system that is designed specifically for physicians, and that has decision support tools, such as the ability to detect allergy, lab result, and duplicate medication contraindications.

13. EHR Portal
- A single user interface that provides an aggregate view of the facility's clinical information, including medical record transcriptions, lab results, med lists, etc.

14. Bulk Scanning of clinical information, such as medical records, handwritten notes, telemetry readings, etc.
- Many facilities may have scanning solutions for insurance cards and other facility management functions, but the facility only meets this criterion if the system is capable and intended to be used for the bulk scanning of medical records.

15. Surgery Management System
- The computerization of pick lists and preference cards, usually with a scheduling component.

16. Interface Engine/Expertise
- Most small hospitals rely on their core vendors to create point to point interfaces with other systems, but some have invested in interface engines to control the movement of the data themselves.

4. HIT Density Study Results

The results of the study are represented below in the form of bar graphs, along with commentary relating to each bar graph representation. The systems are considered adopted if they have been implemented or if they have been purchased and are scheduled for implementation in 2006. The hospitals have been de-identified, in order to avoid competitive advantage issues.

**Figure 1: Density of HIT Adoption in RWHC Member Hospitals (Aggregate View)**
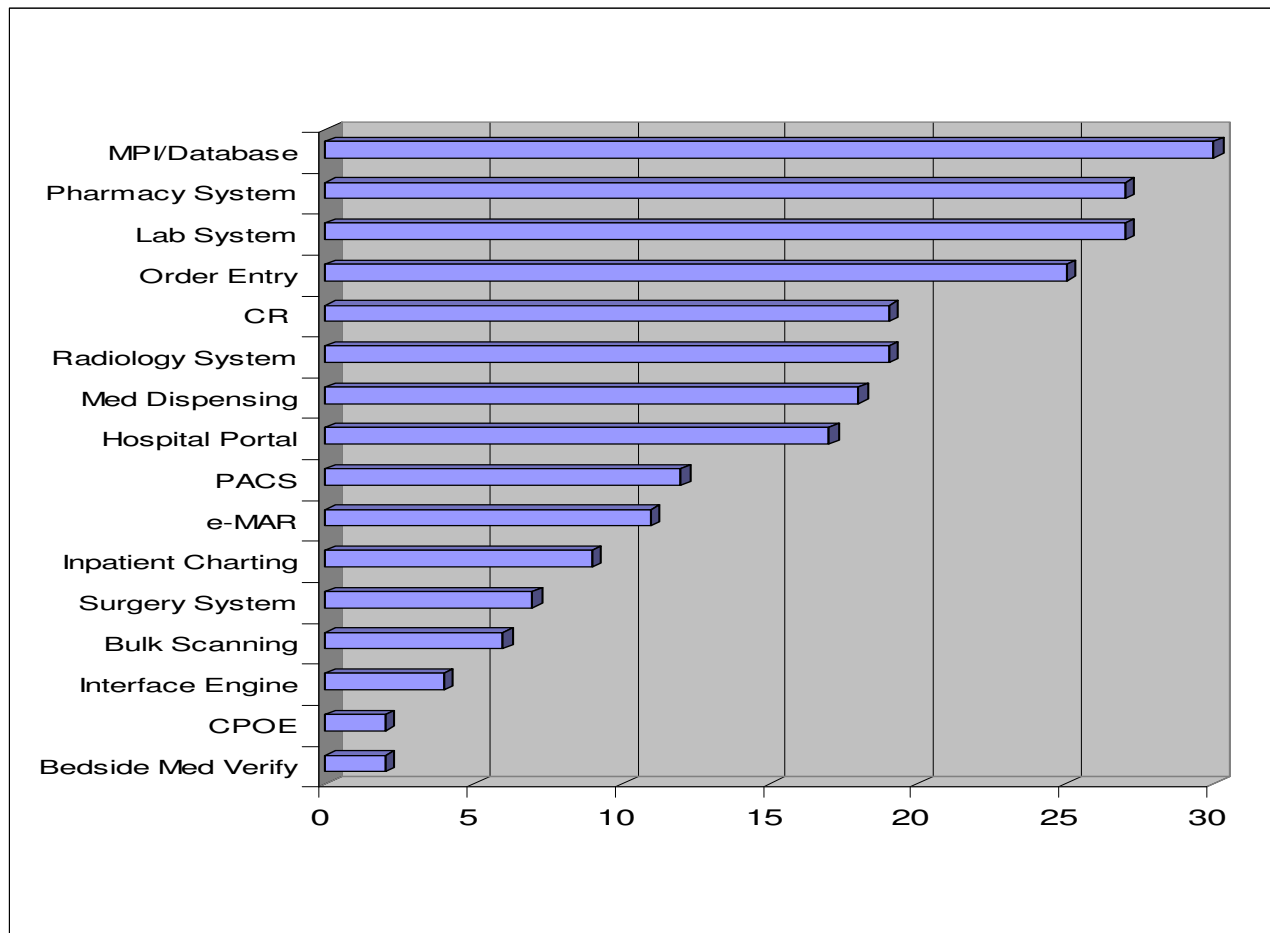
Commentary relating to Figure 1
- No real surprise that every hospital has a core MPI/Database
- The deep penetration of pharmacy, lab, and radiology systems, with over 80% of respondents reporting their adoption, is a positive sign.
- A majority of hospitals have CR, RIS, medication dispensing, and some sort of aggregate view of clinical data available to providers.
- PACS adoption is higher than expected, with 8 hospitals having their own PACS systems, and 4 others storing their digital images in a PACS system.
- Regarding e-MAR, inpatient charting, and surgery, it makes sense that we see a significant drop off here, as these clinical systems are costlier, require advanced change management and educational resources, and require significant ongoing investment to operate.
- There's a low number of hospitals with interface engines, and it's important to point out here that hospitals with interface engines do not necessarily have a large number of clinical systems implemented, as we'll see in Figure 4

- The low adoption of CPOE and med verification is likely due to the expense and provider change management challenges associated with these systems. Those facilities that have built to these patient safety systems have followed integrated models and put the other pieces in place first, as we'll see in figure 4.

Figure 2: HIT Adoption by Facility
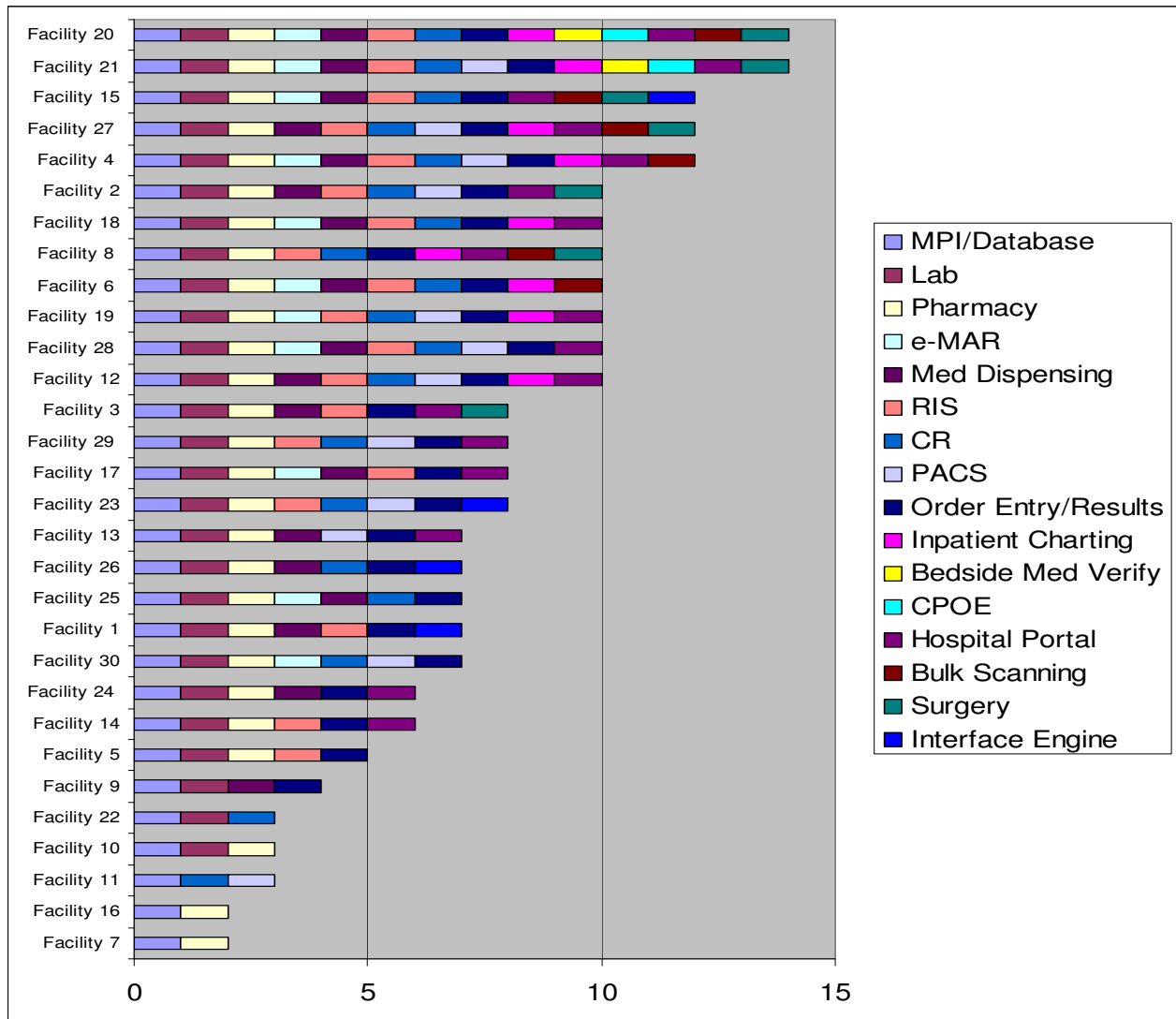
Commentary relating to Figure 2
- Hospitals have anywhere between 2 and 14 of the 16 indicators.
- Over half the hospitals have at least 8 of the 16 indicators
- Those with advanced patient safety systems (CPOE and medication verification) use integrated systems (see figures 3 and 4) and have implemented the other parts of their EHR environment first.

Figure 3: Hospital Information System (HIS) Architecture
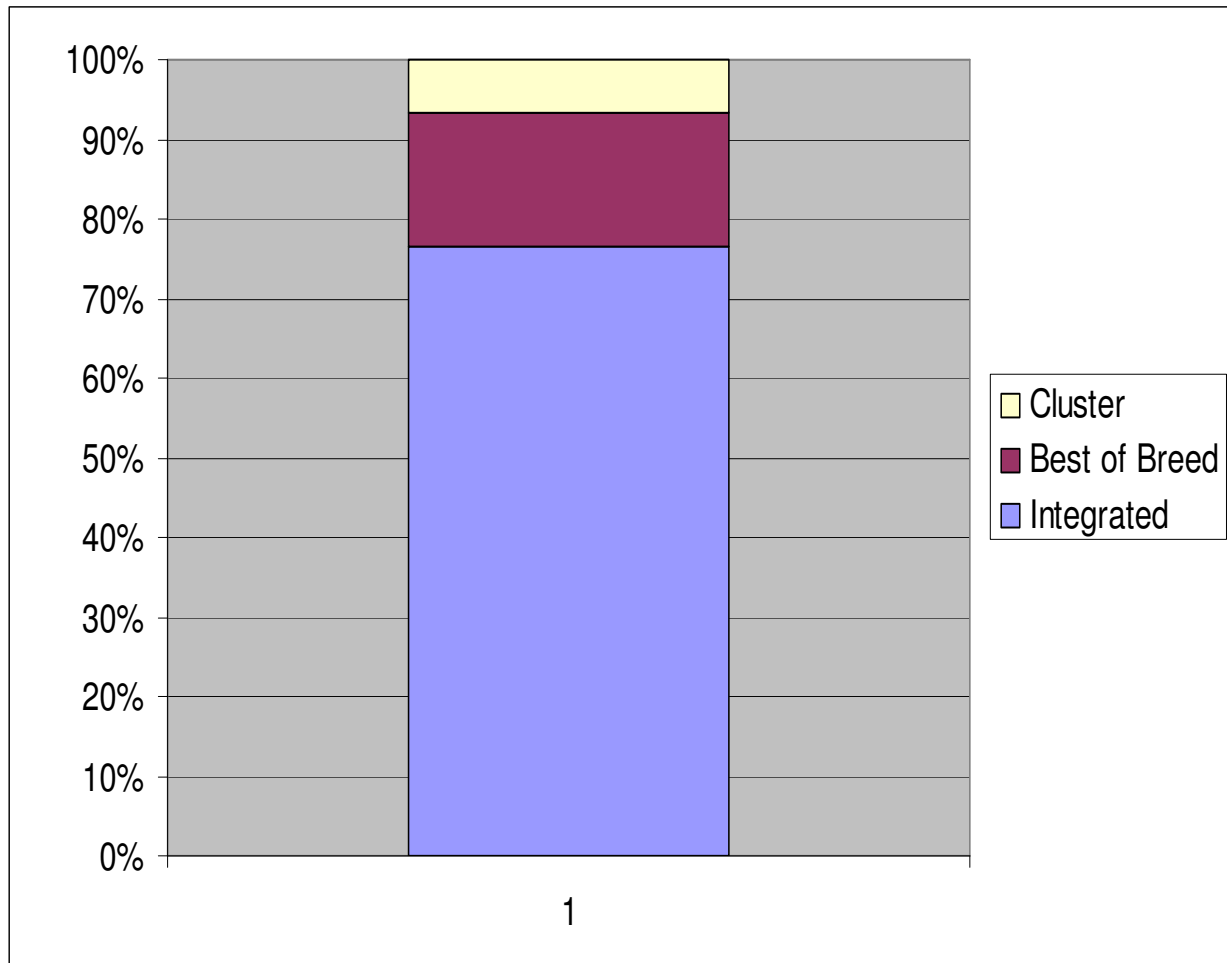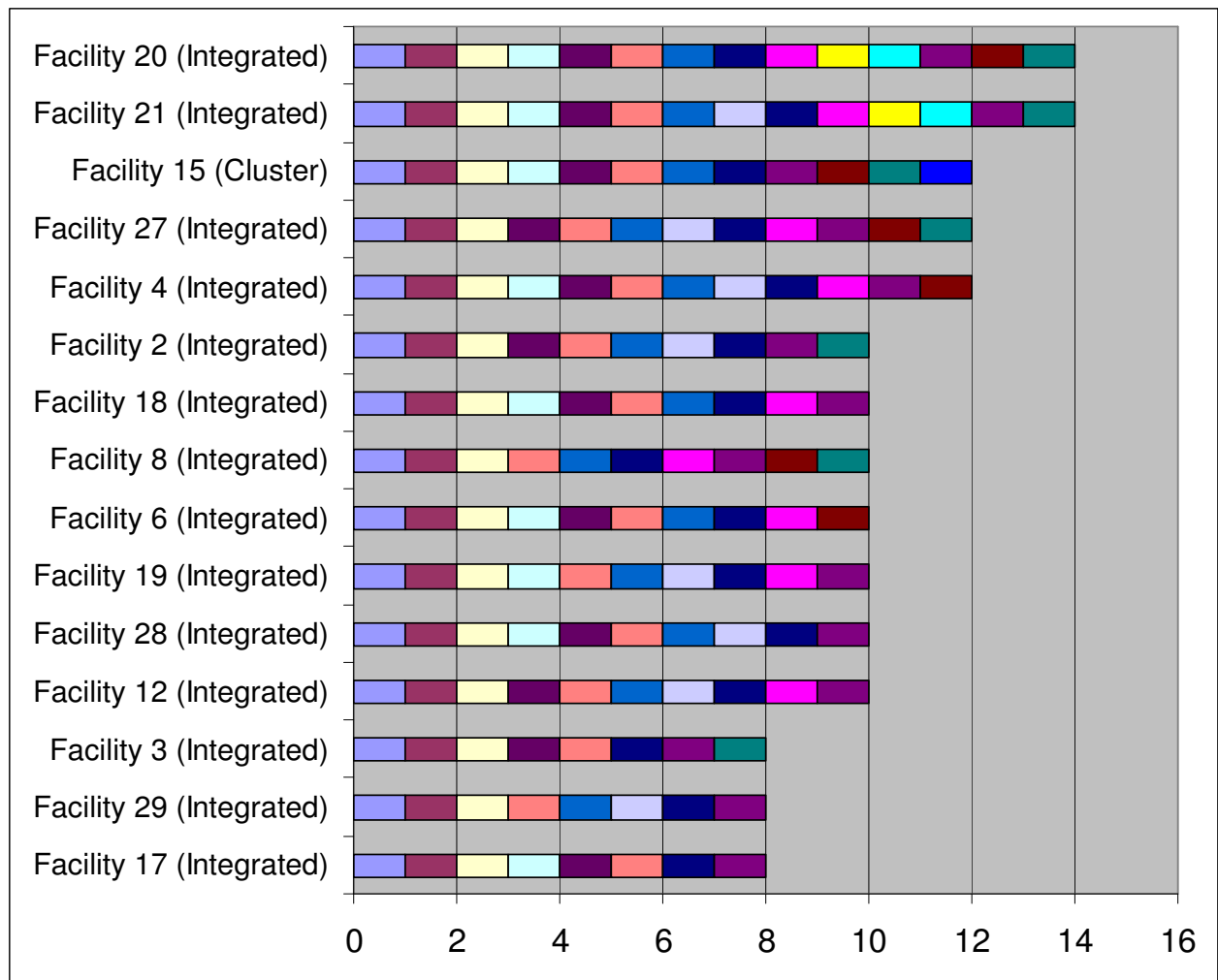

Commentary relating to Figure 3
This slide breaks out hospital system implementation strategies by HIS architecture, with nearly 80% of hospitals using an integrated strategy.

Integrated is defined as the strategy of using primarily one vendor for HIS needs.

Cluster is defined as the strategy of using a limited cluster of vendors for HIS needs, as when one vendor is used for clinical functions and another for financial and facility management functions.

Best of breed is defined as the strategy of using many disparate vendors in a variety of areas/departments. (In the small hospital context, best of breed often means least of breed, as low cost stand alone systems are common in the HIT marketplace.)

Figure 4: HIT Density Related to Architecture

Commentary related to figure 4

- Significantly, 14 of the top 15 HIT adopting hospitals use an integrated strategy for HIS implementation
- Only one hospital (the cluster hospital) in this group has an interface engine. Not captured in this slide is the fact that this hospital has a significantly larger number of staff devoted to supporting their environment than the integrated hospitals.
- The two hospitals that have implemented advanced patient safety systems (CPOE and medication verification) use an integrated strategy and have implemented the other parts of their EHR environment first.
- The 6 other cluster and best of breed hospitals are in the bottom half of clinical system implementers.

Figure 5: HIT Density Related to Volume (represented by Net Patient Revenue)
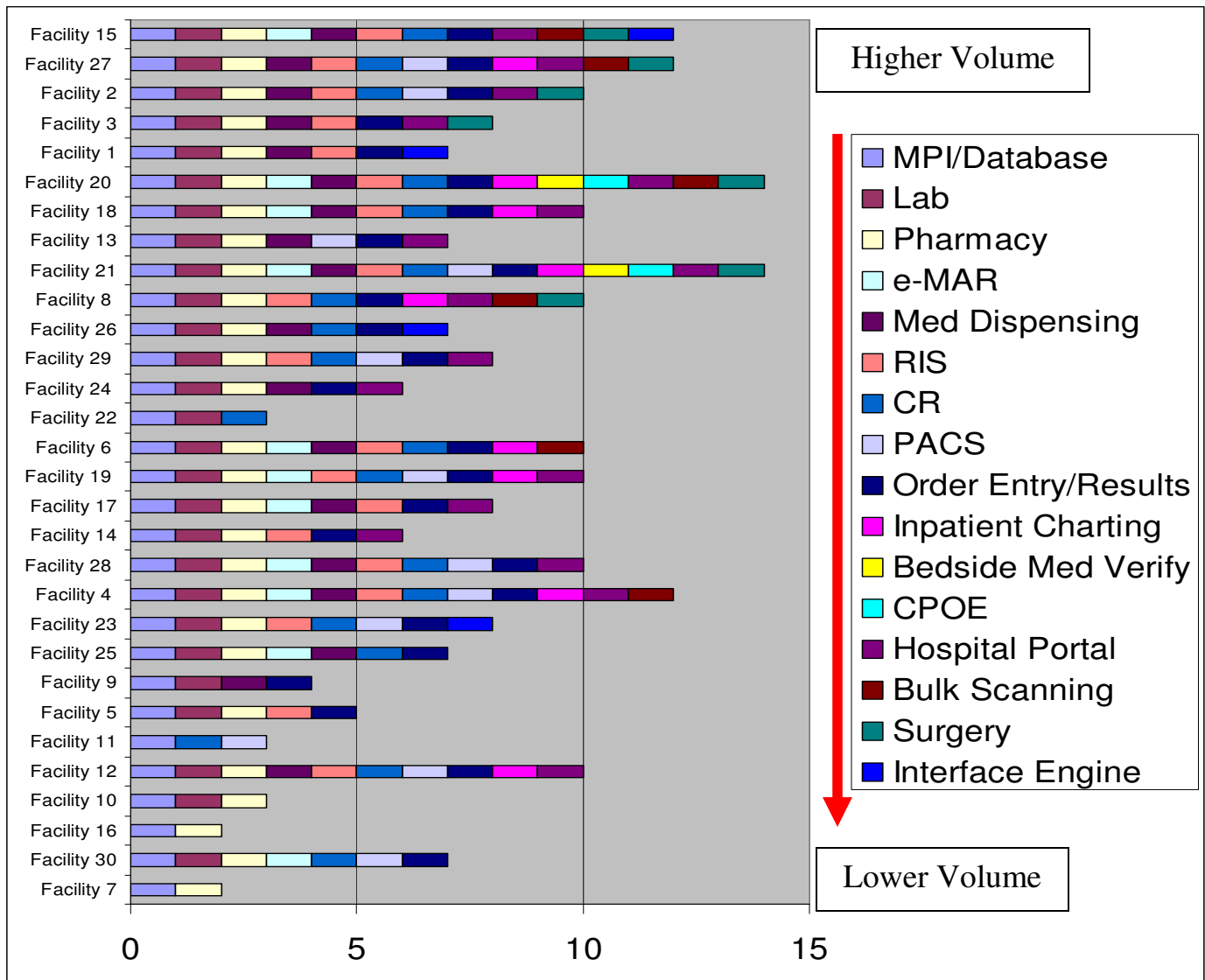
Commentary related to figure 5
- One would expect a higher adoption of HIT in higher volume hospitals, as higher volume may correlated with (1) more capital, (2) more IT staff, (3) and greater HIT financial return on investment, to the extend that HIT financial ROI depends on volume, which it often does.
- Interestingly, we don't see a clear trend in this regard among the top two thirds of these facilities. It's only when we look at very lowest volume facilities that we see a dramatic drop-off in clinical system use.
- It's important to note that even the lowest volume facilities (such as facilities 30 and 12) are capable of making significant strides.

Figure 6: HIT Density Related to Affiliation with Larger Organization
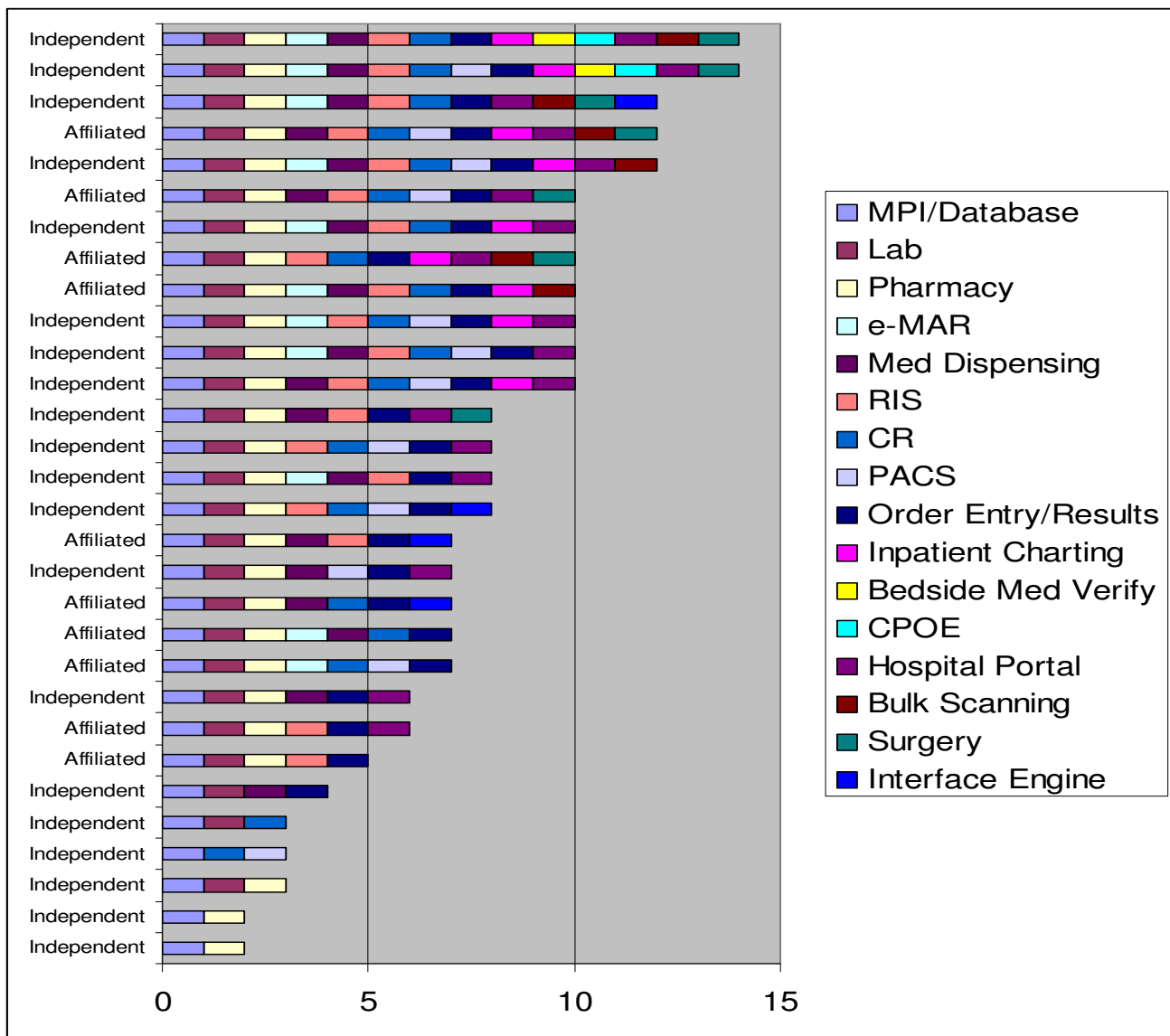
Commentary related to figure 6

10 of the 30 RWHC member hospitals are either owned or in some way affiliated with larger organizations, so that they may (now or in the future) get assistance with their EHR building process from these larger organizations. This slide identifies affiliated hospitals and their levels of HIT adoption.

- HIT adoption is clearly not dependent on affiliation with larger organizations, as 4 of the 5 top adopters are independent hospitals.
- Affiliated hospitals may or may not have significant HIT adoption. It would be interesting to determine whether this correlates with the HIT adoption rates of their affiliate organizations.

- The lowest six HIT adopters are independent organizations. Given their low levels of adoption these organizations may need assistance with their EHR implementation process, possibly through collaborative implementations, which several of these hospitals are currently in the process of planning.

5. Conclusions

A variety of conclusions have already been drawn in the commentary. In summary, key takeaways include the following:

1. *There is significant density of HIT adoption in RWHC member hospitals, perhaps more than expected, given their size.*

2. *HIT adoption is increasing, as many study participants noted plans for 2007 implementations that are not reflected in this report.*

3. *The integrated single vendor model seems to be especially successful for smaller hospitals.*

4. *There is low interfacing engine adoption even in high HIT density facilities (without exception, integrated model facilities do not own interface engines).*

5. *Avoiding the complexities of interfacing by using an integrated strategy may be a key way that smaller hospitals succeed in expanding their HIT adoption to advanced patient safety systems.*

6. *The service volume of an organization is not necessarily predictive of HIT adoption until you look at the lowest volume facilities.*

7. *Affiliation with a larger organization is not predictive of HIT adoption, though organizations with the fewest HIT systems implemented tend to be independent.*

8. *Low volume—particularly low volume unaffiliated—organizations may need help implementing EHR systems.*

6. Recommendations for Public Policy, especially in relation to statewide information exchange efforts

These results and conclusions have a variety of implication for public policy makers as they plan for a health information exchange environment in Wisconsin. Preliminary recommendations by the Rural Wisconsin Health Cooperative include the following:

1. Beware EHR-lite.

Some states have advocated partial EHR systems for small facilities as a way to get some data rather than no data. EHR-lite systems have been defined in a number of ways. If EHR-lite systems are defined as partial EHR systems that do not have a clear migration path to advanced patient safety systems and tools, then policy makers should beware advocating these, as a position in favor of this type of EHR-lite may slow down what our data shows is a movement toward **real** EHR adoption.

(Note: EHR-lite has sometimes been confused with EHR ASP models, which are remotely hosted EHRs. There are many robust ASP implementations throughout the country—INHS, SISU, etc. We support ASP models to the extent that they provide a clear migration path to advanced patient safety systems.)

2. Don't make small hospitals choose between investing in internal patient safety HIT and information exchange.

According to the Santa Barbara Data Exchange <u>Moving Toward Electronic Health Information Exchange: Interim Report</u> (2003) "The analysis shows that there are positive returns to health information exchange in all except small communities (e.g., one hospital and less than 100 physicians)…" And according to the Advisory Board NIHIT Briefing (2005), "hospitals and providers foot 97% of the ongoing costs (of information exchange), yet receive just 56% of the potential benefits. The remaining benefits are dispersed among payers and other stakeholders."

Given the above reality, and the additional reality that even internal HIT system implementation doesn't always have a financial ROI for small volume facilities, it is important to make sure costs associated with information exchange do not place an undue burden on smaller hospitals and thereby slow down the implementation of clinical and patient safety systems.

The implementation of robust EHRs and associated patient safety systems by small hospitals will do more to protect Wisconsin residents living in rural communities than information exchange without these systems.

3. Smaller hospitals will need help interfacing to (and from) the information exchange environment that emerges.

Even small hospitals that are advanced in their EHR adoption generally do not have interface engines or interface expertise, and often have limited IT resources inhouse. Given this reality, it is important that interfacing hardware, software, and expertise resources be provided to smaller facilities to the extent that these are required for full participation in information exchange.

As we look forward to a Wisconsin information exchange environment, we must consider that an early phase of this environment could force providers to login to at

least 2 information sources (their local EHR, and the RHIO or statewide system). Larger hospitals with interface expertise will address this issue by creating interfaces to bring the exchange information back into their local EHR systems as soon as data standards allow. There is a danger that small hospitals without interface expertise will be left behind in this dysfunctional multiple login environment unless there are plans and resources to assist them.

4. ***Develop ways to help low volume facilities implement EHRs (through matching grants, loans, collaborative arrangements, etc.)***

Lowest volume facilities have the hardest time implementing EHRs, due to the fact that the cost of building and maintaining EHRs can be prohibitive for these facilities, and a financial ROI from their EHR implementations may not exist, given their low volumes. Public policy makers should find ways to support our smallest healthcare facilities in their efforts to implement EHRs; and to support multi-organizational EHR building collaborative efforts that have been shown to be successful in other regions and states.

A number of Rural Wisconsin Health Cooperative member hospitals, including most of the small volume hospitals identified earlier, are currently engaged in planning for such a collaborative effort.

5. ***Do not compete on the exchange of information: Value must accrue to all participants.***

Many small hospitals have referral relationships with multiple referral centers. The information exchange that emerges in Wisconsin **MUST** allow for the flexible flow of clinical data so that small hospitals aren't forced into predetermined data exchange relationships that primarily benefit large hospitals and their rural outreach programs. **Wisconsin HIT needs public highways, not private, limited access toll roads.**

7. Recommendations for Further Research

- Expand the HIT Density indicators to include additional HIT systems.
- Establish criteria for a qualitative analysis of the HIT density indicators, such as levels of system adoption.
- Expand the study to determine status of HIT linkages between rural hospitals and public health immunization registers and other population health initiatives.
- Expand the study to include non-RWHC CAHs in the state of Wisconsin, which may shed light on the impact of collaboratives on HIT adoption.
- Expand the study to include all Wisconsin hospitals, in order to shed light on the difference between rural and urban hospital HIT adoption levels.
- Expand the study to include out-of-state hospitals, in order to determine whether the Wisconsin experience is characteristic or anomalous.